International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue I, Jan 2019- Available at www.ijraset.com

Implementation of System of Linear Equations to Traffic Flow for a Network of Four One -Way Streets in Benz-Circle Vijayawada

Dhanalakshmi. M[1], V. Jyothi[2], S. Tulasi[3], G. Sai Anusha[4], Y. Sushma[5]
[1, 2, 3]*Department of Mathematics, Sri Durga Malleswara Siddhartha Mahila Kalasala, Vijayawada,A.P, India,*
[4, 5] *Students, Department of Mathematics, Sri Durga Malleswara Siddhartha Mahila Kalasala, Vijayawada, A.P, India,*

***Abstract:** In this paper, we apply a system of linear equation to determine the number of vehicles that should be allowed to route a four – one - way streets in Benz circle, Vijayawada, in order to-traffic flowing. The system of equations applied in the model were solved analytically using the method of Gauss Jordan elimination method.*
***Keywords:** Mathematical model, Traffic congestion, Traffic flow, Traffic volume.*

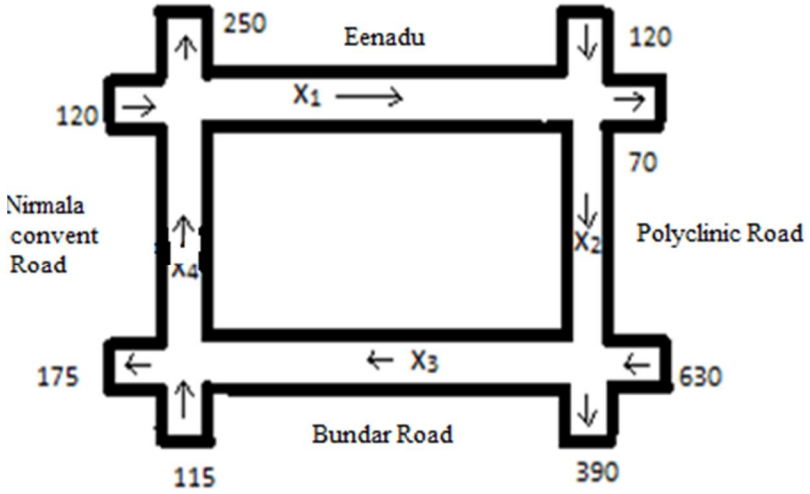
I. INTRODUCTION

In mathematics and civil engineering, traffic flow is the study of interaction between vehicles, drivers and infrastructure with the aim of understanding and developing an optimal road network with efficient moment of traffic minimal traffic congestion problems. Mathematical theory of traffic flow and traffic equilibrium analysis was first introduced by Frank Knite in 1920's and was refined in to wardrops first and second principles of equilibrium. A network consists of branches and nodes.

For examples in the street networks where the branches are the streets and the nodes are the interaction. In this network problem can be solved by system of linear equation.

The following diagram shows part of the central section OF. The streets are one way, and that the average number of vehicles entering and leaving. This section during the 10 min breaks between classes is given the chart.

Find the amount of the traffic between each of four intersection.



Consider the number of vehicles entering each intersection is equal to the number of vehicles leaving the intersection, this fact can be shown by an equation.

$x_4 + 120 = x_1 + 250$
$x_3 + 115 = x_4 + 175$
$x_2 + 630 = x_3 + 390$
$x_1 + 70 = x_2 + 120$

Rewrite the system of linear equations

$-x_1+0x_2+0x_3+x_4 = 130 \quad \rightarrow (1)$

$0x_1+0x_2+1x_3-0x_4= 60 \quad \rightarrow (2)$

$0x_1+x_2 -x_3 +0x_4 = -240 \quad \rightarrow (3)$

$x_1 -x_2 +0x_3 +0x_4 =50 \quad \rightarrow (4)$

The augment matrix of the system is

$$A = \begin{bmatrix} -1 & 0 & 0 & 1 & 130 \\ 0 & 0 & 1 & -1 & 60 \\ 0 & 1 & -1 & 0 & -240 \\ 1 & -1 & 0 & 0 & 50 \end{bmatrix}$$

The rows reduced to enhance from this matrix is

$$\sim \begin{bmatrix} 1 & 0 & 0 & -1 & 130 \\ 0 & 1 & 0 & -1 & -180 \\ 0 & 0 & 1 & -1 & 60 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Rewrite this as a linear system

$x_1 = x_4+130$

$x_2 = x_4 - 180$

$x_3 = x_4+ 60$

Since there is a free variable, this problem has many possible solution but $x_4 >180$.

As an example $x_4 = 400$ the solution of the system will be

$x_1 = 530$

$x_2 = 220$

$x_3 = 460$

II. CONCLUSION

We have estimated the traffic congestion at the four way street linking Polyclinic road, Nirmala convent road, Bundar road and Bundar road interchanging Polyclinic road can be minimised. If any road work on Bundar road interchange to Nirmala convent road should allow for traffic volume of atleast 60 vehicles per hour. Therefore, to maintain the traffic flow 460 vehicles per hour must be routed between Bundar road and Nirmala convent road, 270 vehicles per hour between Eenadu and Polyclinic road and 220 vehicles per between the interaction of Eenadu and Bundar road.

REFERENCES

[1] Wikipedia encyclopedia, traffic flow.

[2] G.William, linear algebra with application, 7th edition, Jones and Barnetlett publisher, LLC, UK(2011).

[3] A text book of B. Sc mathematics volume (III), S. Chand Publications.